Branches of Life

Use inherited traits to build and test evolutionary trees.

FB.5.5 "Enrichment: Create and analyze models that illustrate the relatedness between all living things (cladograms/phylogenic trees)."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the inherited traits used as evidence for branches, and circle the five animals being compared.

Who Shares a Branch?

1. At a museum, a frog skeleton sits near displays of a chicken, a mouse, a chimpanzee, and a human. A visitor might group the chicken with the frog because both lay eggs, or the human with the chicken because both walk on two legs. A phylogenetic tree tests a different idea: which groups share a more recent common ancestor? Each fork represents an ancestral population whose descendants split into lineages. A trait is most useful when it arose in a shared ancestor and was inherited by its descendants. Traits that evolve independently can make distant branches look alike.

2. The five animals all have backbones and four limbs, although limbs have changed shape across lineages. Frogs develop without the amniotic membranes that protect embryos in chickens and the three mammals. Chickens lay shelled eggs, while mice, chimpanzees, and humans feed their young milk and grow hair. DNA comparisons provide another clue: across many sequences, humans and chimpanzees share more inherited DNA changes with each other than either shares with mice. These clues can be placed on branches to test which arrangement best explains the animals' shared traits.

3. A tree is not a ladder from simple to complex. The fork connecting two living species does not mean that one species alive today gave rise to the other. It represents an ancestral population, while the tips represent lineages living today. A trait seen in every animal in this set, such as a backbone, cannot separate one of the five from the rest. Egg laying is also tricky: frogs and chickens lay eggs, but mammals develop with amniotic membranes before birth. Compare several inherited features rather than letting one familiar similarity decide the branches.

2 ANSWER WITH EVIDENCE

Use the passage

1. Which animal's lineage should split first from the other four? Name the shared trait that supports this split.

2. Which two animals should share the most recent fork? What evidence supports your choice?

3. Should the mouse branch closer to the human or the chicken? Use two inherited traits to explain.

4. A classmate places the frog and chicken on adjacent tips because both lay eggs. What evidence argues against that placement?

3 YOUR TURN

Your own words

Four imagined cave species, A, B, C, and D, all have jointed legs. A alone lacks antennae, and only C and D have a tail fan. Draw a branching tree with four named tips, label where antennae and the tail fan first evolved, and write one sentence identifying the closest pair and the evidence.

Branches of Life

PART 1 · READ AND MARK

Underline the inherited traits used as evidence for branches, and circle the five animals being compared. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Which animal's lineage should split first from the other four? Name the shared trait that supports this split.	**The frog lineage splits first. The other four develop with amniotic membranes.**
2	Which two animals should share the most recent fork? What evidence supports your choice?	**Humans and chimpanzees. Across many DNA sequences, they share more inherited changes with each other than either shares with mice.**
3	Should the mouse branch closer to the human or the chicken? Use two inherited traits to explain.	**The mouse branches closer to the human. Both grow hair and feed their young milk, unlike the chicken.**
4	A classmate places the frog and chicken on adjacent tips because both lay eggs. What evidence argues against that placement?	**The chicken shares amniotic membranes with the mammals, while the frog lacks them. Egg laying alone does not support placing the frog and chicken together.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Tree: (A,(B,(C,D))). Antennae first evolved on the branch leading to B, C, and D; the tail fan first evolved on the branch leading to C and D. C and D are the closest pair because they share the tail fan.

Accept any tree orientation with A branching first, B next, and C and D sharing a fork. Trait labels must appear on branches leading to every species that has the trait.